Bentgrass Green Performance

Initial Investigations of Mowing Height and Rolling

By D.M. Kopec, J. Long, D. Kerr and J.J. Gilbert

Faster ball speed on putting greens is one of the greatest demands on the modern golf course superintendent. A number of factors have changed the expectations that golfers have when they reach the putting surface. They include: increased popularity of the sport and the resulting need for faster play; greater competition among golfers; better equipment for greens maintenance; and more precise greens construction specifications.

One cultural management practice to increase green speed is the roller. Rolling turf is not new, but interest in this specialized application for golf greens as part of a standard maintenance program has resurfaced in the past decade. The proclaimed benefits of rolling include increased ball speed, a more true ball roll, increased speeds at higher (and less stressful) mowing heights and consistency in performance among greens on a golf course.

Therefore, a study was devised to investigate the effects of mowing height, rolling, rolling frequency and initial testing of surface hardness levels of greens as they relate to ball (distance) speed.

Study Materials and Methods

Three experiments were conducted on a four-year-old Penncross creeping bentgrass green at the University of Arizona Karsten Turfgrass Facility in Tucson. The green measured 60 x 60 feet. It was irrigated nightly with 80 percent Eto replacement from an on-site weather station.

Mowing Height and Ball Rolling
The first test evaluated the effects of mowing height and periodic rolling on ball speed. Two mowing heights were evaluated, 9/64 inch and 11/64 inch. Both heights were studied with and without rolling with a 680-pound, 30-inch-wide, smooth roller. The roller provided a linear contact of eight pounds per square inch on the surface.

The low-cut, no roll treatment was consistently faster than the high-cut, rolled treatment.

Plots were mowed six times weekly with a Toro Tournament walk-behind greens mower and clippings were removed. The mower was 21 inches wide and included a smooth roller. Rolled plots were rolled in a single direction twice per week.

Balls speeds were taken with a USGA specification stimpmeter twice per week, immediately following the mowing and rolling treatments. Up to three balls (same type) were released in each of two directions and averaged to eliminate any directional effect. Each release point was established by inserting a flag in the green at the base of the stimpmeter and ball speed was assessed to the nearest half inch of travel. All ball speed data within a mowing height/roll plot was averaged and used to determine main treatment and interaction effects.

Double Rolling — The objective of the second test was to determine the impact on ball speed of a single, double rolling (two directions) event. The same green was used as in the first test. In addition to the four previous treatments (high cut - no roll, high cut - roll, low cut - no roll, low cut - roll) two further treatments were added (high cut - double roll, low

cut - double roll). Plots were measured immediately after double rolling, two days after double rolling, and four days after double rolling. Daily mowing continued throughout the test.

Surface Hardness — Surface hardness measurements for all plots were taken with a Clegg surface impact penetrometer. This unit measures surface hardness by the rate of deceleration of a cylinder (hammer) dropped through a tube to the surface. The faster the hammer decelerates as it hits the surface, the harder the surface is considered. Use of this unit to assess hardness has been reported in sports turf, but not for golf course greens in relationship to ball speed. One measurement was made per plot.

These values were correlated with actual ball speeds to see if hardness readings were related to rolling performance.

Results

Mowing Height and Ball Rolling

The low-cut (9/64-inch), rolled treatments were fastest, followed by low-cut, no roll. Generally there was a 10 percent difference between the two top treatments. Our data showed that the low-cut, no-roll treatment was consistently faster than the high-cut, rolled treatment. Rolling made a 15 percent difference between rolled and non-rolled turf at the 11/64-inch height.

The relative differences among treatments remained constant throughout the evaluation periods. While actual mean ball speed values did not result in an accumulation of ball speed with time, roll treatments did have greater speed than non-roll counterparts in all cases.

An expected benefit of rolling is to maintain ball speed while maintaining elevated mowing heights to reduce mowing stress. Results showed non-rolled, low-cut

MEAN BALL SPEED VALUES

Mean Ball Speed Values of a Penncross Bentgrass Green. Karsten Turfgrass Research Facility, University of Arizona, Tucson.

Rolling Date	*Roll High-Cut Inches*	*No Roll High-Cut Inches*	*Roll Low-Cut Inches*	*No Roll Low-Cut Inches*	*Roll 2X Low-Cut Inches*	*Roll 2X High-Cut Inches*
3/22	96.6	85.4	108.2	101.9		
3/24	101.75	93.9	116.25	105.4		
3/29	98.1	91.1	103	94.2		
3/31	102.9	108	105.1	104.4		
4/5	95.9	85.7	114.9	104.9		
4/7	103	90.3	120.8	112.5		
4/12	100.5	91.5	118.7	109.1		
4/14	96.9	87.1	117.5	112.5		
4/21	92.1	84.9	112.1	102.4	114.4	94.3
4/23	84.8	83	107	101.8	104	82.8
4/25	83	82.8	105	100.3	104.5	84.5

High-Cut = 11/64 inch., Low-Cut = 9/64 inch.

turf was still faster than rolled, high-cut bentgrass. This proved true throughout eight rolling treatments.

Double Rolling — In all cases, the low-cut turf had greater performance than the high-cut, regardless of rolling frequency and the one-time double roll. The effect of the double roll was slightly greater than the single roll immediately after rolling. The single and double treatments had similar performance at two and four days after rolling, revealing a quick loss of effect. The double roll, low-cut treatment increased ball speed by 3 percent over the single-roll, low-cut turf, and 6 percent over no-roll, low-cut turf.

High-cut treatments showed the same general trend relationships as the low-cut, except they were consistently slower. The double roll event increased ball speed over the single roll turf on day one, and four days after rolling (high cut only). However, at four days after treatment the effect of all rolling was drastically reduced as ball speeds of the rolled turf were close to the unrolled check.

Comparision between the two heights of cut showed that unrolled, low-cut turf was 17 percent faster than unrolled, high cut. It also showed that double rolling caused an immediate increase in speed of 11 percent to both low-cut or high-cut turf. This difference however did not last for more than a day.

Height of cut alone had a greater effect on ball speed than rolling alone. However, rolling did increase ball speeds considerably at each cutting height. The effects of the double roll for a single event increased speed slightly over the single roll. Effects essentially lasted for only one day, based on a one-time, double-roll event.

Surface Hardness — Ball rolls were significantly different due to management treatment effects, as were the hardness values. On May 15, after eight treatments, ball speeds ranged from 73 to 99.5 inches. Plots that received low mowing had higher ball speed values than the higher mowed plots. This demonstrated the effect of lower mowing heights on ball speeds.

At the low mowing height, there was no difference in surface hardness between single and double rolling events. At the high mowing practice, the double rolled plots had only a slightly greater ball speed mean value than the single rolled turf. At each mowing height, the effect of rolling was significantly greater than the unrolled turf. After a single reenactment of the rolling practice, there was no difference between rolling frequency events. The same results occurred in the mowing height study. Long-term rolling tests need to be conducted.

Low-cut, no-roll treatment was consistently faster than the high-cut, rolled treatment. The effect of the double roll was slightly greater than the single toll immediately after rolling.

Clegg surface penetrometer readings ranged from 114 to 138. Values were larger for the low mowed turf, over that of the high mowed turf. For the low mowed turf, the double rolled treatments had a six percent increase over no rolled turf. There was no statistical difference in surface hardness values between single-rolled and double-rolled turf at the 9/64-inch height of cut.

At the high mowing heights (11/64 inch) there were no significant differences for surface hardness values between rolling frequency treatments, nor were rolling treatments different from the mowed only turf at 11/64 inch. As was the case with ball speed, low mowed turf had the highest Clegg values, showing an association between rolling and surface hardness.

If all rolled turf plots (single and double rolled) are compared to non-rolled turf at both heights, the effect of rolling was highly evident and significant for surface hardness. The low-mowed turf had slightly higher Clegg values than higher-mowed turf.

However, ball speed did not correlate with higher Clegg values on low cut bentgrass. Higher impact values were strongly associated with slower ball speeds. It did correlate at the higher (11/64 inch) cut. Additional research is needed to determine if these initial effects continue on a regular scheduled rolling program for greens.

David M. Kopec is extension specialist turf and pasture grass, Plant Sciences Department of the University of Arizona, College of Agriculture, Tucson.